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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,253	12/19/2005	James M. Tour	11321-P068WOUS	6532
7590	06/17/2009		EXAMINER	
Robert C Shaddox Winstead Sechrest Minick PO Box 50784 Dallas, TX 75201			CHEUNG, WILLIAM K	
			ART UNIT	PAPER NUMBER
			1796	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/561,253	TOUR ET AL.	
	Examiner	Art Unit	
	WILLIAM K. CHEUNG	1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 16 March 2009.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-28 and 31-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-28 and 31-34 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ . | 6) <input type="checkbox"/> Other: _____ . |

DETAILED ACTION

1. In view of the amendment filed March 16, 2009, claims 29-30 have been cancelled. Claims 1-28, 31-34 are pending.
2. In view of the amendment filed March 16, 2009, the rejection of Claims 11, 12, 29, 30, 32 under 35 U.S.C. 112, second paragraph, is withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. Claims 1-28, 31-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tour et al. (WO 02/060812) in view of Lamb et al. (US 3,554,992) for the reasons adequately set forth from paragraph 5 of the office action of December 15, 2009.

Art Unit: 1796

1. (Currently Amended) A method comprising:
 - a) providing functionalized carbon nanotubes,

wherein the functionalized carbon nanotubes comprise a functionalized species on the sidewall of the carbon nanotubes are selected from the group consisting of:

 - (i) aryl halide functionalized carbon nanotubes, and
 - (ii) carbon nanotubes comprising species comprising a nucleation sites operable for initiating a polymerization reaction selected from the group consisting of anionic polymerization and or ring opening polymerization;
 - b) dispersing thesaid aryl halide functionalized carbon nanotubes in a solvent;
 - c) adding to the solvent at least one reagent selected from the group consisting of:
 - (i) an alkyllithium species, wherein the alkyllithium species reacts with the aryl halide functionalized carbon nanotubes,
 - (ii) a metal, and wherein the metal reacts with the aryl halide functionalized carbon nanotubes and replaces aryl halide bonds with aryl metal bonds;
 - (iii) a deprotonating agent, wherein the deprotonating agent deprotonates the nucleation sites of the functionalized carbon nanotubes and form initiator groups for the anionic or ring opening polymerization;

wherein the at least one reagent reacts with the functionalized carbon nanotubes to form a polymerizable species;
wherein the polymerizable species is selected from the group consisting of an aryl-lithium species comprising aryl-lithium bonds, an aryl-metal species comprising aryl-metal bonds, and initiator groups;
wherein deprotonation of the nucleation sites forms the
 - d) adding a monomer to the solvent; and
 - e) initiating a polymerization reaction anionic or ring opening polymerization between utilizing the monomer and the polymerizable species functionalized carbon nanotubes to form a polymer-carbon nanotube material;

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

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2. (Currently Amended) A method comprising:

- a) providing aryl halide functionalized carbon nanotubes;
- b) dispersing thesaid aryl halide functionalized carbon nanotubes in a solvent;
- c) adding an alkylolithium species to the solvent,
wherein the alkylolithium species reacts with the aryl halide functionalized carbon nanotubes to form an aryl-lithium species comprising aryl-lithium bonds;
- d) adding a monomer to the solvent; and
- e) initiating a polymerization reaction anionic or ring opening polymerization between utilizing the monomer and the aryl-lithium species functionalized carbon nanotubes to form a polymer-carbon nanotube material,
wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

3. (Currently Amended) A method comprising:

- a) providing aryl halide functionalized carbon nanotubes;
- b) dispersing the aryl halide functionalized carbon nanotubes in a solvent;
- c) adding a metal to the solvent,
wherein the metal reacts with the aryl halide functionalized carbon nanotubes to form and replaces aryl halide bonds with an aryl-metal species comprising aryl-metal bonds;
- d) adding a monomer to the solvent; and
- e) initiating a polymerization reaction anionic or ring opening polymerization between utilizing the monomer and the aryl-metal species functionalized carbon nanotubes to form a polymer-carbon nanotube material,
wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

10. (Currently Amended) A method comprising:

- a) providing functionalized carbon nanotubes,
wherein the species functionalized on the carbon nanotubes comprise nucleation sites for a polymerization reaction; at least one initiation site operable for
wherein the polymerization reaction is selected from the group consisting of anionic polymerization and or ring opening polymerization;
- b) dispersing the functionalized carbon nanotubes in a solvent;
- c) adding a deprotonating agent to the solvent,

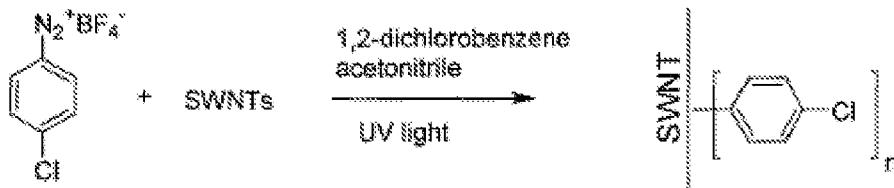
wherein the deprotonating agent deprotonates the nucleation sites of the functionalized carbon nanotubes and to form initiator groups for the anionic or ring opening polymerization reaction;

- d) adding a monomer to the solvent; and
- e) initiating anionic or ring opening a polymerization reaction between utilizing the monomer and the initiator groups functionalized carbon nanotubes to form a polymer-carbon nanotube material.,

wherein the polymerization reaction is selected from the group consisting of anionic polymerization and ring opening polymerization.

Tour et al. (page 8/12 of figures, Figure 15) disclose the preparation of single-wall carbon nano-tube (SWNT) functionalized with aryl chlorine containing functionality.

Figure 15



Then, Tour et al. (page 2, line 13-18) disclose halogenated SWNT can participate reactions with alkyl-lithium reagent (via Grignard reaction mechanism). Further, Tour et al. (page 31, claims 125-129) disclose that the functionalize SWNT can undergo various polymerization mechanisms that includes anionic polymerization.

Regarding claim 10 which recites "operable for anionic or ring opening polymerization", in view of the substantially identical SWNT disclosed in Tour et al. and as claimed, the examiner has a reasonable basis that the "operable" feature is inherently possessed in Tour et al.

Regarding claim 33 which recites "the step of utilizing the polymer-carbon nanotube material in a drug delivery process" or regarding claim 34 which recites "the step of utilizing the polymer-carbon nanotube material for scaffolding to promote cellular tissue", the recitations are merely related to the intended use of the claimed process, applicants must recognize that a recitation of the intended use of the claimed invention must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

The difference between Tour et al. and the invention as claimed is that Tour et al. do not teach the specific mechanism for preparing a polymer.

However, Lamb et al. (col. 3, line 14 to col. 4, line 75) clearly disclose the specifics for using a Grignard reaction for initiating a polymerization process. Lamb et al. (col. 3, line 41-53) disclose the types of monomers that are suitable for the polymerization process as claimed. Lamb et al. (col. 3, line 54-67) disclose the use of ethereal solvents and hydrocarbon solvents for the polymerization process. Although Lamb et al. do not specifically indicate the use of THF as one of the ethereal solvent, however, it would not be difficult to one of ordinary skill in art recognize and appreciate that THF is also an ethereal solvent. (see http://en.wikipedia.org/wiki/Grignard_reaction)

Regarding the claimed "terminating agents" of claims 25, 26, Lamb et al. (col. 4, line 44) clearly disclose the use of methanol for precipitating the polymers from the solution, the examiner has a reasonable basis that one of ordinary skill in art would have recognized that the disclosed "method" is a terminating agent, and that other

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organic alcohols, such as ethanol would also be a functional equivalence of the disclosed methanol terminating agent. (see

http://en.wikipedia.org/wiki/Grignard_reaction)

Regarding the concentration feature of claim 27, and the temperature feature of claim 28, the mere variation of concentration and temperature are considered obvious because it is within the skill of one of ordinary skill in art to apply "routine optimization" process to optimize that concentration and temperature conditions of a polymerization process, motivated by the expectation of increasing the yield or the improving the quality of the polymer products.

Motivated by the expectation of success of preparing a polymer with a Grignard reagent, it would have been obvious to one of ordinary skill in art to incorporate all reaction related specifics as taught in Lamb et al. into Tour et al. to obtain the invention as claimed.

Regarding the "deprotonating agent" of claims 14-15, the variation of concentration of claim 27, and the polymerization temperature of claim 28, Tour et al. (page 2, line 13-18) clearly disclose that halogenated SWNT can participate reactions with alkyl-lithium reagent (via Grignard reaction mechanism). Further, Tour et al. (page 31, claims 125-129) disclose that the functionalized SWNT can undergo various polymerization mechanisms that includes anionic polymerization. The minor variation of the reaction conditions of an explicitly taught polymerization route is considered obvious. Motivated by the expectation of success of developing a polymerization process using halogenated SWNT, it would have been obvious to one of ordinary skill in

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art to consult general information on Grignard reaction to obtain the polymerization conditions as claimed in claims 27, 28. (see

http://en.wikipedia.org/wiki/Grignard_reaction)

Applicant's arguments filed March 16, 2009 have been fully considered but they are not persuasive. Applicants argue that the Grignard chemistry as taught in Tour et al. is not operable because the alkyl-lithium reagents teachings of Tour et al. involve a Grignard reaction mechanism. However, the examiner disagrees because the reaction of substantially identical alkyl-lithium reagent and functionalized nanotubes (see also specification: paragraph 0026-0027), the examiner has a reasonable basis the claimed polymerization mechanism is inherently possessed in Tour et al.

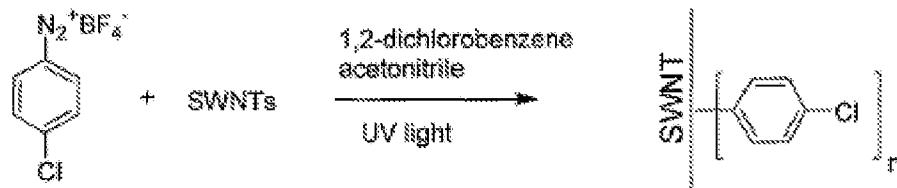
Regarding applicants' argument that Lamb et al. involve a reaction with nitriles, nitroso compounds, aldehydes, ketones, esters, inorganic compounds and olefinic oxide to for a Grignard complex for achieving other function groups, which would not lead to a polymerization process, however, applicants must recognize that Lamb et al. (col. 3, line 14 to col. 4, line 75) clearly disclose the specifics for using a Grignard reaction for initiating a polymerization process. Applicants must recognize that the initiation of a polymerization does not necessarily involve a reaction with nitriles, nitroso compounds, aldehydes, ketones, esters, inorganic compounds and olefinic oxide. Further, Lamb et al. (col. 3, line 41-53) clearly and explicitly disclose the types of monomers that are suitable for the polymerization process as claimed. Lamb et al. (col. 3, line 54-67) disclose the use of ethereal solvents and hydrocarbon solvents for the polymerization

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process. Just because the reagents of Lamb et al. are taught to be usable for other chemistry, the teachings do not teach away from the explicit teachings of Lamb et al. (col. 3, line 14 to col. 4, line 75) for using an alkyl-lithium to initiate a polymerization process.

Regarding applicants' argument that there is no expectation for the Grignard complex teachings of Lamb et al. to be reactive with the functionalized carbon nanotubes of Tour et al., applicants fail to recognize that Tour et al. (page 8/12 of figures, Figure 15) clearly disclose the preparation of single-wall carbon nano-tube (SWNT) functionalized with aryl chlorine containing functionality. Then, Tour et al. (page 2, line 13-18) clearly disclose halogenated SWNT can participate reactions with alkyl-lithium reagent (via Grignard reaction mechanism).

Figure 15



In view of the reasons set forth above, the rejection is maintained.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to WILLIAM K. CHEUNG whose telephone number is (571)272-1097. The examiner can normally be reached on Monday-Friday 9:00AM to 2:00PM; 4:00PM to 8:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David WU can be reached on (571) 272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/William K Cheung/
Primary Examiner, Art Unit 1796

William K. Cheung, Ph. D.
Primary Examiner
June 16, 2009